

## Quarterly Eos Contract Report - Report #15

Period: January 1 - March 31, 1993

Remote Sensing Group (RSG), Optical Sciences Center, University of Arizona

Principal Investigator: P. N. Slater

Contract Number: NAS5-31717

Report compiled by: K. J. Thome

### Task Progress:

S. Biggar and K. Thome travelled to Flagstaff, Arizona on January 13-14 to meet with H. Kieffer and K. Edwards of the USGS and G. Geller, S. Hook, M. Pniel, and C. Voge of JPL to discuss Level 1 processing of ASTER data. Biggar, P. Slater, and Thome attended the Joint ASTER Team Meeting in Las Vegas, February 1-5. Slater presented work being done on combining pre-flight, on-board, and ground-based calibration methods to obtain an appropriately weighted, best estimate of in-flight absolute calibration as a function of time. This work is applicable to both ASTER and MODIS. Biggar presented his work on the transfer-absolute radiometer and Thome gave a presentation on atmospheric correction in the solar reflective range. Biggar sent ASTER team leader A. Ono information regarding MODIS on-board calibration and suggestions for measuring the polarization sensitivity of the VNIR and SWIR sensors. Thome faxed H. Lang of JPL comments regarding a preliminary study of DEM requirements for atmospheric correction in the solar reflective region. Biggar and Thome compiled and sent information to S. Hook of JPL regarding anticipated test sites to be used by the Remote Sensing Group. Thome also sent Hook a brief algorithm description for the atmospheric correction in the solar reflective region. Slater attended the ASTER Calibration Peer Review and the ASTER PDR Report meeting in Japan March 6-15.

Slater attended the SeaWiFS meeting in Annapolis, Maryland from January 19-22 where he presented several concepts for performing a preflight solar diffuser calibration using the sun as a source. As a result of this talk Biggar and Thome travelled to Santa Barbara, March 6-9 to aid SBRC in a solar-based, preflight calibration of SeaWiFS. B. Crowther, D. Gellman, and K. Thome travelled to Mt. Lemmon to calibrate the

instruments used in the SeaWiFS work and the filters from these instruments were sent out to be scanned to determine their spectral-transmittance properties. Preliminary results from this work have been sent to A. Holmes of SBRC. Final results are expected in April and Biggar will present a paper on this work at the SPIE conference in Orlando April 12-16.

Biggar and Slater attended the Eos Calibration Panel Cross-Calibration meeting in San Diego January 28-30 where Biggar presented our cross-calibration plans and calibration ground test sites. Biggar and Slater also attended the MODIS Team meeting March 22-26 in Washington, D. C. Biggar presented an update of his work on the VNIR transfer radiometer and described the preflight calibration of SeaWiFS mentioned above. Slater reviewed the MCST plans for calibration and initiated action for a peer-review of these plans.

J. M. Palmer continued refurbishing the Cary spectrophotometer and took delivery of a vibration-isolated optical table. Palmer completed work on a thermal-infrared calibration of Landsat TM and will present his results at the SPIE conference in Orlando. Construction of our black lab used in calibration measurements was completed and preparations begun for making tests of black paint samples. S. Schaeffer and B. Crowther installed thermoelectric temperature stabilization for the SWIR spectroradiometer. Schaeffer also modified the data collection software for the instrument. The Photometrics camera for M. Brownlee's BRDF camera has recently arrived. Work will begin on mounting the Nikon fisheye lens to the camera and interfacing to the computer which should arrive shortly.

Biggar completed assembly of the absolute radiometer's power/control module in preparation for preliminary SNR measurements. He received the filters for the absolute radiometer and had them scanned to determine their spectral-transmittance properties. He also measured the apertures of the instrument with a precision-travelling microscope, completed preliminary dark current tests, and tested the data acquisition software. The radiometer was taken to SBRC in conjunction with the above-mentioned SeaWiFS trip and placed in front of SBRC's integrating sphere. Biggar will present a paper on the radiometer at the upcoming SPIE meeting.

Gellman and Slater continued work on combining pre-flight, on-board, and ground-based calibration methods to obtain an appropriately weighted, best estimate of in-flight absolute calibration as a function of time. Gellman will present results of this work as applied to SPOTs-1 and -

2 at SPIE. Gellman also performed preliminary work on calibrating NOAA-11 and -12 AVHRRs using SPOT-2 and data collected at White Sands in November 1991 and August 1992. Gellman also developed software to compute solar ephemeris information for our solar radiometer data reduction software.

Thome and H. He read the Landsat-5 TM Level 0 data from the August White Sands calibration campaign. These data were used in a visible and near-infrared calibration of TM, the results of which will be presented at SPIE. Plans were made for a trip to White Sands the first week of April for a SPOT-2 calibration. We will be joined on this trip by two visiting scientists from France, P. Lecomte and R. Santer, who intend to measure polarimetric surface reflectance. The trip will also be used to test the SWIR spectroradiometer and other equipment. In preparation for this trip Gellman modified the hitch of the reflectomobile to reduce the front to back tilt of the trailer. He also had parts machined to allow the French scanning polarimeter to be mounted to the reflectomobile. S. A. Recker and A. J. McKinney performed all administrative tasks.

#### Problems/Corrective Actions:

The only real problems encountered during the reporting period involve the SWIR spectroradiometer. The thermoelectric coolers intended to cool and stabilize the temperature of the instrument's grating housing are not cooling the grating well enough. Schaeffer insulated the grating housing but this proved insufficient. More powerful TE coolers have been ordered and will be installed. These new coolers will present a problem in terms of power consumption. We are currently investigating solutions to this problem.

#### Anticipated Actions:

The above-mentioned modifications will be made to the SWIR spectroradiometer and further field tests performed with the instrument. R. Parada will perform tests of our Spectron VNIR spectroradiometer and attempt to calibrate it. Thome will develop the prototype version of the atmospheric correction for ASTER in the solar reflective region. Related to this work, Thome will investigate test criteria for selecting between the Japanese Science Team's atmospheric correction algorithm and the American team's. A sensitivity analysis of the atmospheric correction to errors from input data will be performed and sent to the team leader. Gellman will begin work on our mobile laboratory by investigating different trailers and tow vehicles. Gellman and Slater will continue

studying ways of incorporating different calibration techniques. M. Brownlee will begin construction of the BRDF meter. Palmer will continue work on the Cary spectrophotometer and Biggar will complete preliminary tests of the absolute-transfer radiometer. Tests of black paints will be completed and our black lab repainted and assembled.

Members of the Remote Sensing Group will present eight papers at the SPIE Orlando conference.